SOV/147-58-3-12/18

AUTHOR: Tikhonov, V.B.

TITLE: On the Solution of the Rotary Sprayer (Swirl Atomizer) (K raschetu tsentrobezhnoy forsunki)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Aviatsionnaya tekhnika, 1958, Nr 3, pp 95-104 (USSR)

ABSTRACT: According to Abramovich (Ref.1) for an ideal sprayer of fluids all its characteristics, viz; the coefficient of the active cross-section φ, the coefficient of the mass flow μ and the angle of spread 2α, depend on the geometrical parameter A, as given by Eq.1 to 4. Similar relations were also developed by Taylor (Ref.2) and Zenger (Ref.3) while in Ref.6 a new parameter C was introduced as well (the last Eq. on p 95). Relating the axial velocity of the fluid through the nozzle of the sprayer (V_x) to the dimensions of the nozzle (Fig.1) and the parameters A and φ together with the condition of the maximum flow ($d_\mu/d_\varphi = 0$) it is found that $C = V_x$. Starting with this fact and using the hydraulic analogy between the surface waves in the shallow water and the flow of gases in ducts (as shown in Ref.4) the author

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develops theoretical relations for the rate of discharge from a rotary sprayer. The basic assumption are as follows: 1) the transverse component of velocity of the velocity of the fluid is small in relation to the aerial velocity; 2) the axial velocity is constant at any cross section, i.e. the flow may be represented as a layer of a thickness h and of a velocity V; 3) the thickness of the stream issuing from the nozzle is small compared to the size of the nozzle; 4) the amplitude of the wave is not assumed negligible and for this reason in the Euler equation it is necessary to retain small quantities of the second order with reference to velocity (Ref.5). On the basis of one-dimensional theory (and taking into account the axial symmetry) Eq.2.1 to 2.4 follow, and from the continuity requirement Eq.2.5 is obtained. Because of the small thickness of the stream, Eq.2.6 is assumed, from which Eq.2.7 and 2.8 are derived, which are again transformed by two substitutions $\overline{p}$ = ph and $\overline{p} = \int(p - p_a)dh$. These new equations resemble dynamic equations of a compressible gas in an adiabatic flow, so that the theory of shockless

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flow of the gas may be applied to examine the discharge of the liquid from the sprayer. The analogy between the flow of gases and swirling liquids is discussed also by Binni et al.(Ref.6,7). Introducing now the concept of "sonic velocity" for this case ($C^2 = x\bar{p}/\bar{p}$) it is found that this concept represents the velocity of spreading of axial waves on the surface of the issuing liquid, from which condition Eq.2.9 is obtained. $M^* = 1$ gives the formula obtained by Abramovich (Ref.1) so that M^* appears to be the similarity parameter corresponding to Mach number in the flow of gases. Therefore it follows that the parameter A is not the unique criterion defining the outflow of inviscid liquids from the sprayer and that the relation between A and φ depends on the type of flow. If the thickness of the layer varies, M^* depends on the ratio of the cross sectional area at any given point and that minimum cross sectional area, i.e. $M^* = 1$ is the critical parameter, therefore to determine the type of the discharge for a given sprayer it is necessary to know

Card 3/6 $M^* = f(A)$. This is done through Eq.2.1, 2.2, 2.10, 2.11

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and 2.12, the first two being derived before, 2.10 being obtained from the moment of momentum, 2.11 from Bernoulli's equation (energy) and 2.12 from continuity considerations. Taking now relation 1.4 and the momentum equation along the axis of the swirler nozzle (Eq.2.13) at two adjacent stations 1 and 11 (Fig.3), section 1 being chosen where the air vortex is yet unchanged (and taking into account air pressure on the free surface) the author derives eventually Eq. 2.14 to 2.16 and 2.14' to 2.16'. The last 3 equations are presented in the form of a graph together with the corresponding equations of Abramovich (Ref.1) as Fig.4. In the figure is also included the graph $M^* = f(A)$ as given by Eq.2.26 which is obtained by equating relations 2.9 and 2.14. From the figure it is seen that $M^* = 1$ occurs when $A = 2$ and this represents the critical type of flow at which all the parameters of Ref.1 are identical with the corresponding parameters derived here (i.e. φ, μ, 2α etc). For $A > 2$, "supersonic" type of flow exists whose characteristics are: increasing axial component of velocity and decreasing thickness of the layer of liquid and, as a result of this, On the Solution of the Rotary Sprayer (Swirl Atomizer)

decreasing radial component of velocity giving a much smaller angle of spread (with $A = \infty$ this gives $2\alpha = 109°47'$ as compared with $180°$ of Ref.1). For $A \geqslant 2$, the coefficients of discharge is the same in both cases, which is in full agreement with gas dynamics where the mass flow is the same as in the critical section (throat). A change of the type of the flow may be obtained by changing the geometry of the sprayer, $A = 2$ being the critical criterion. The existence of the analogy between the fluid flow from a sprayer and the gas flow in ducts enables us to explain qualitatively the principle of the maximum discharge and the limits for its applicability. In the swirler an air vortex is formed of such dimensions which, for a given discharge, results in a minimum pressure. The flow will be maximum if the conditions are critical ($M^{*} \geqslant 1$).
In practical cases (real liquids) the viscosity affects the position of the critical section, the thickness of the liquid stream in it and the velocity but it may be assumed that with increased geometrical characteristic

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the effect of viscosity diminishes. To verify this theory some experiments were carried out within the range of A from 2 to 6. Two parameters were measured: mass flow μ and angle of spread 2α. The results are given in Fig.4 (circles); they agree very well with the theoretical curves.(Triangular points are from experiments to verify Abramovich's theory of Ref.1) There are 4 figures and 9 references of which 5 are Soviet and 4 English.

ASSOCIATION: Moskovskiy Aviatsionnyy Institut, Kafedra AD-2 (Moscow Institute of Aeronautics, Chair AD-2)

SUBMITTED: 27th February 1958.

Card 6/6

26.2311

25118
S/535/60/000/119/002/009
E191/E481

AUTHORS: Tikhonov, V.B., Candidate of Technical Sciences and
Yakovlev, Ye.A., Engineer

TITLE: High temperature stabilized electric arcs of large power (electric arc plasmotrons)

PERIODICAL: Moscow. Aviatsionnyy institut. Trudy, No.119, 1960. Rabochiye protsessy v teplovykh dvigatel'nykh ustanovkakh, pp.43-70

TEXT: Stabilized high power electric arcs yield plasma jets with relatively simple engineering means under stationary conditions. They permit to simulate under laboratory conditions the phenomena of aerodynamic heating at large Mach numbers and to examine the properties of materials at high temperatures, apart from various experiments concerned with the physics of atoms and ions. A table of German and American plasmotron installations shows maximum temperatures in the channel up to 52000°K (Kiel University). German and American installations are described and their working principles explained. Some theoretical investigations are recited concerning the plasma of an arc discharge, based mainly on German literature. An account is given of the spectrographic analysis of

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High temperature stabilized ...

radiation in the channel and in the high temperature jet of an electric arc plasmotron carried out at the Moscow Aviation Institute. The effect of electromagnetic fields on the motion of plasma in the arc discharge channel is analytically examined. It is concluded that for the stabilization of the arc channel in plasmotrons, it is possible to use not only water or other liquids but also various gases (hydrogen, nitrogen, argon, air and others). In the practical utilization of electric arc plasmotrons for technical and physics work, the determination of the composition, temperature, velocity and other properties of the plasma assumes the greatest importance. The solution of these problems is associated with great difficulties of procedure and practical engineering. There are 16 figures, 2 tables and 25 references, 10 Soviet and 15 non-Soviet. The reference to an English language publication reads as follows: Elasser W., The Physical Review, 1954, Vol.95, No.1.

Card 2/2

S/535/60/000/119/006/009
E191/E481

AUTHORS: Latyshev, L.A., Candidate of Technical Sciences, Rutovskiy, N.B., Candidate of Technical Sciences and Tikhonov, V.B., Candidate of Technical Sciences

TITLE: Experimental investigation of the effect of pipe line vibrations on the parameters of the liquid flowing inside

PERIODICAL: Moscow. Aviatsionnyy institut. Trudy, No.119, 1960. Rabochiye protsessy v teplovykh dvigatel'nykh ustanovkakh, pp.111-123

TEXT: Referring to G.W.Housner (Ref.2: Bending vibration of a pipe line containing flowing fluids, Journal for Applied Mechanics, 1952, Vol.19, No.2), the equation of motion in a vibrating tube with fluid is recited. Housner found that both internal and external forces significantly affect the parameters of the liquid flowing in a vibrating pipe line and that the pipe line can become dynamically unstable at large rates of flow. Neither Housman nor later American investigators have treated the effect of mechanical factors on the hydrodynamics of fluid flow inside the vibrating tube. A system of equations is added describing the non-
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Experimental investigation of ...

stationary motion of the fluid in the tube. Friction is ignored having regard to the relatively short pipe lines in aircraft power systems. In view of mathematical difficulties, a vibration test rig was built with forcing frequencies of 25, 50, 75, 100, 125 and 175 cps, which are the resonance frequencies of cantilever springs. The range of liquid flow was between 1 and 4 m/sec. The vibrating tube which may be straight or coiled is connected by two hose lengths to the hydraulic circuit, wherein the feeding and collecting tanks both have free liquid surfaces so that the pipe vibrations are not overshadowed by hydraulic circuit vibrations. The general level of pressure is maintained by compressed air. The vibrations are induced by an electromagnetic system. The pressure is measured with a capacitive pressure transmitter. The fluid flow, the vibration frequency, the vibration amplitude and the fluctuations in the fluid pressure and its rate of flow were continuously recorded during the experiments. Several results of these tests are plotted and discussed. The work is stated to be proceeding and the numerical results described must be regarded as significantly affected by the mechanical features of the installation rather than possessing a general validity. The only
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E191/E481

Experimental investigation of ...

general feature shown up is the unquestionable major degree of interaction between the fluid flow and the physical vibration of the pipe line. For example, the vibration of the pipe has a substantial effect on the liquid mass flow. Conversely the rate of flow has a substantial effect on the vibration amplitude, other things being equal. Sh.L.Zlotnik and V.S.Ushakov are mentioned in the paper. There are 9 figures and 8 references: 4 Soviet and 4 non-Soviet. The four references to English language publications read as follows: Housner G.W., Journal for Appl. Mechanics, 1952, Vol.19, No.2; Niordson F.J.H., Transactions of the Roy.Inst. of Technology, Stockholm U.D.C. 534, 131, 2,1953, No.73; Handelman G.H., Quarterly of Appl. Mathematic, 1955, Vol.XIII, No.3; Long R.H. Jr., J. for Appl. Mechanics, 1955, Vol.22, No.1.

Card 3/3

VAYNBERGER, Isaak Matveyevich; VASENIN, Aleksandr Yermolayevich; IZRAILIT, Lev Abramovich; REBETSKIY, Dmitriy Borisovich; SPORIUS, Eduard Alekseyevich; TIKHONOV, Vasiliy Fedorovich; FAYNSHTEYN, Vladimir Maksovich; LAMM, I.A., otv. red.; SAKHAROV, Ye.D., red.

[Mechanication and automation of mail processing operations] Mekhanizatsiia i avtomatizatsiia obrabotki pochty; informatsionnyi sbornik. Moskva, Izd-vo "Sviaz'," 1964. 77 p. (MIRA 17:6)

L 15885-66 EWT(l)/EWT(m)/EEC(k)-2/ETC(f)/EPF(n)-2/EWO(m)/T/EWP(t)/EWA(h) IJP(c)

ACC NR: AT6002494 SOURCE CODE: UR/3136/65/000/949/0001/0008

JD/WW/JG

AUTHOR: Kondrat'yev, F. V.; Sinyutin, G. V.; Tikhonov, V. F. 59

ORG: Institute of Atomic Energy im. I. V. Kurchatov, Moscow (Institut atomnoy energii) B+1

21

TITLE: Effect of pile radiation on the performance of a cesium diode 25,44

SOURCE: Moscow. Institut atomnoy energii. Doklady, IAE-949, 1965. Vliyaniye izlucheniya reaktora na rabotu tseziyevogo dioda, 1-8

TOPIC TAGS: cesium electron tube, nuclear reactor, volt ampere characteristic, diode electron tube

ABSTRACT: In connection with the practical applications of thermoemissive transducers which convert heat produced by nuclear reactors into electric energy, the authors studied the effect of a pile radiation field on the characteristics of a cesium diode. The measurements were made at cathode temperatures of 1500, 1700, and 2000C and cesium vapor pressure from 10^{-2} to several mm Hg. The VVR-2 pile 19 of the Institute of Atomic Energy (Institut atomnoy energii) was used as the radiation source. It was found that the pile radiation field changes the volt-ampere characteristics of the diode, and that during the operation of the diode in

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the radiation field under predetermined conditions, a change in the preselected optimum parameters, primarily the cesium vapor pressure, can take place. This requires further studies of the effect of radiation on cesium diodes. Orig. art. has: 5 figures.

SUB CODE: 18 / SUBM DATE: none

Card 2/2 9C

TIKHONOV, V. I., KUZNETSOV, P. I., STRATONOVICH, R. L.

"Passage of Certain Random Functions Through Linear Systems", Avtomatika i Telemekhanika, Vol 14, No 2, 1953, pp 144-163.

Discusses linear systems in which the input and output of asignal is connected integrally by means of the kernel (the transfer function of a system), depending on the time and parameter.

Determines generalized correlative functions as coefficients of expansion of characteristic functions of n-multiple distributions of probabilities and establishes the correlations, binding the output correlative functions to the input functions. For the case of stationary output signals the characteristics of proximity of certain functions of the density of probability (sharp attenuation and possession of one peak) to the density of Gaussian distribution is discussed. Other results arising from transient random signals through linear systems, may be found in in the works of A. N. Kolmogorov (Jubilee Collection, Acad Sci USSR, Moscow, 1947), where full analysis of the case of stationary disturbances and constant transmitting function of the system is given; cf. V. S. Pugachev (Izvestiya Akademii Nauk, Seriya Matematika, 1953, No 5, 401-420) and Zadeh (Proc. J.R.E., 1950, Vol 38, No 11, 1342-1345). (RZhMekh, No 11, 1954)
SO: Sum. No. 443, 5 Apr. 55

--TIKHONOV, V.I.

KUZNETSOV, P.I. (Moskva); STRATONOVICH, R.L. (Moskva); [redacted] (Moskva).

Transmission of random functions through nonlinear systems. Avtom. i telem. 14 no.4:375-391 Jl-Ag '53. (MIRA 10:3)
(Automatic control)

TIKHONOV, V.I.

"Introduction to the statistical dynamics of automatic control systems" by V.V.Solodovnikov. Reviewed by V.I. Tikhonov. Avtom. i telem. 14 no.4: 475-477 Jl-Ag '53. (MLRA 10:3)
(Automatic control)
(Tikhonov, V.I.)

TIKHONOV, V. I.

PETROV, B.N.; TSYPKIN, Ya. Z.; KURAKIN, K.I.; TIKHONOV, V.I.; SIYITSYN, A.S.

Resolutions of the committee selected by the seminar on the theory of automatic control after discussing. V. V. Solodovnikov's book "Introduction to the statistical dynamics of automatic control systems". Avtom. i telem. 14 no.4:477 Jl-Ag '53. (MIRA 10:3)
(Automatic control)

TIKHONOV, V. I.

KUZNETSOV, P. I., STRATONOVICH, R. L., and ~~TIKHONOV, V. I.~~

"Passage of Random Functions Across Nonlinear Systems," Avtomatika i telemekhanika, Vol 15, No 3, pp 200-205, 1954

Examines the nonlinear problem of the best approximation of some function f (t) by the method of choosing moment functions. When certain assumptions are made this problem reduces to the solution of a system of integral equations. One example is considered in which a system of algebraic equations replaces the integral equations. (RZhMekh, No 4, 1955)

SO: Sum, No 606, 5 Aug 55

KUZNETSOV, P.I.; STRATONOVICH, R.L.; TIKHONOV, V.I.

Continuity of the products of probability functions. Zhur.tekh. fiz. 24 no.1:103-112 Ja '54. (MLRA 7:2)
(Probabilities) (Mathematical statistics)

TIKHONOV, V. I. FD-620

USSR/Physics - Brownian Motion

Card 1/1 : Pub. 146-10/18

Author : Kuznetsov, P. I.; Stratonovich, R. L.; and Tikhonov, V. I.

Title : Correlation functions in the theory of Brownian motion; Generalization of the Focker-Planck equation

Periodical : Zhur. eksp. i teor. fiz. 26, 189-207, February 1954

Abstract : Generalized correlation functions are used in a theory of Brownian motion which goes beyond the framework of Markov processes and uncorrelated random functions. For a sufficiently short time of correlation a differential equation is derived which generalizes the equation of Focker and Planck. It is shown that in special cases the theory discussed in this article reverts to the more usual theory of Brownian motion.

Institution : Moscow State University

Submitted : July 10, 1953

TIKHONOV, V. I.

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Kuznecov, P. I., Stratonovič, R. L., and Tihonov, V. I. Quasi-moment functions in the theory of random processes. Doklady Akad. Nauk SSSR (N.S.) 54, 615–618 (1954). (Russian)

Let $t_1, \ldots, t_n$ be n time points in the range of a random process $\xi(t)$. Denote by

$$f_n(u_1, \cdots, u_n; t_1, \cdots, t_n) = E\left\{\exp\left[i\sum_1^n u_\alpha \xi(t_\alpha)\right]\right\}$$

the characteristic function of the joint distribution of the random variables $\xi(t_1), \cdots, \xi(t_n)$. The quasi-moment functions $b_p(t_{\alpha_1}, \cdots, t_{\alpha_p})$ are defined by the relation

$$f_n(u_1, \cdots, u_n; t_1, \cdots, t_n) \times \exp\left\{-i\sum_{\alpha=1}^{n} s(t_\alpha)u_\alpha - \frac{i^2}{2}\sum_{\alpha_1, \alpha_2=1}^{n} r(t_{\alpha_1}, t_{\alpha_2})u_{\alpha_1}u_{\alpha_2}\right\}$$

$$= \sum_{p=0}^{\infty} \frac{i^p}{p!} \sum_{\alpha_1, \cdots, \alpha_p=1}^{n} b_p(t_{\alpha_1}, \cdots, t_{\alpha_p})u_{\alpha_1} \cdots u_{\alpha_p} \quad \text{with } b_0 = 1.$$

Here $s(t)$ and $r(t_1, t_2)$ are given functions. The author expresses the quasi-moment functions in terms of the cumulant functions and extends his definition to the more general situation of two correlated random processes. The transformation of quasi-moment functions and their use in connection with stochastic differential equations is briefly discussed.

E. Lukacs (Washington, D.C.)

...he Effect of E[illegible] Fluctuations on [illegible]

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[illegible]

phase of the [illegible]

[illegible]

Tikhonov, V.I.

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621.370.232.2: 621.396.62: 621.396.822

Effect of Electrical Fluctuations on a Detector (Wave-Envelope Method).—V. I. Tikhonov. (Bull. Acad. Sci. U.R.S.S., tech. Sci., ~~Oct. [illegible], No~~. 10, pp. 3–13. In Russian.) The detection of a signal which is modulated in amplitude and phase by voltage fluctuations in the i.f. amplifier is considered theoretically for a diode detector with (*a*) a linear, (*b*) a quadratic, and (*c*) an exponential characteristic. Results are also given of an experimental investigation of the modification of the detected voltage probability distribution by the time constant of the detector *RC* circuit.

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BS

TIKHONOV, V.I.

Measurement of elctric fluctuations by means of thermoelectric instruments. Zhur.tekh.fiz. 25 no.5:817-822 My '55. (MLRA 8:7)
(Electric measurements) (Thermoelectricity)

FD-2196

USSR/Physics - Electric fluctuations

Card 1/1 Pub. 146-1/25

Author : Kuznetsov, P. I.; Stratonovich, R. L.; Tikhonov, V. I.

Title : The action of electric fluctuations upon the tube oscillator

Periodical : Zhur. eksp. i teor. fiz. 28, 509-523, May 1955

Abstract : The authors consider the action of "slow" normal fluctuations upon a tube
oscillator. They obtained expressions for the one-dimensional functions
of the probability density for amplitude and phase. They indicate an
approximate method for the calculation of the correlation functions for
amplitude and phase. Their method of solving the behavior of a tube os-
cillator under the action of slowly varying fluctuations is based upon
the application of the generalized Einstein-Focker equation (P. I.
Kuznetsov et alii, ibid. 26, 1954) and is somewhat different from earlier
method (L. Pontryagin, A. Andronov, A. Vitt, ibid. 3, 1933; I. L. Bernsh-
teyn, Izv. AN SSSR, ser. fiz. 14, 1950) for considering internal fluctu-
ations. The authors thank Yu. B Kobzarev. Six references: e.g. A. A.
Andronov and S. F Khaykin, Teoriya kolebaniy (Theory of oscillations),
State Technical Press, 1937.

Institution : Moscow State University

Submitted : June 15, 1954

TIKHONOV, V.I.

Distribution of the duration of peaks of normal fluctuations. Radiotekh. i elektron. 1 no.1:23-33 Ja '56. (MLRA 9:11)
(Distribution(Probability theory)) (Electric waves)

TIKHONOV, V.I.

I-3

Category : USSR/Radiophysics - Statistical Phenomena in Radiophysics

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4430

Author : Tikhonov, V.I.
Title : Effect of Large Fluctuations on Electronic Relays

Orig Pub : Radiotekhn. i elekronika, 1956, 1, No 2, 213-224

Abstract : Calculation of the probability distribution density function for the durations of relay pulses and for the intervals between the pulses when the relay is acted upon by a stationary fluctuating voltage. The average number of relay operations and of coincidence-count circuits is determined for a combined action of periodic pulses and fluctuations.

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TIKHONOV, V.I.

I-3

Category : USSR / Radio Physics. Statistical Phenomena in Radio Physics.

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 7238

Author : Tikhonov, V.I., Amiantov, I.N.
Title : Response of a Self-Excited Generator to Slow Fluctuations.

Orig Pub : Radiotekhn. i elektronika, 1956, 1, No 4, 428-432.

Abstract : The small-parameter method is used to analyze the amplitude and phase fluctuations of an auto-generator, caused by the action of noise with narrow spectrum on the generator. Slow fluctuations in the anode supply of the generator are considered. Relations are obtained for the statistical characteristics of the amplitude and instantaneous frequency, with which the average values and the dispersion of the phase incidence during the time are calculated. In conclusion, by way of an example, an estimate is made of the error introduced by instability of the anode voltage of the generator in the measurement of distance by interference methods.

Card : 1/1

Tikhonov, V. I.

USSR/Radiophysics - Statistical Phenomena in Radiophysics, I-3

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 35257

Author: Amiantov, A. N., Tikhonov, V. I.

Institution: None

Title: Effect of Normal Fluctuations on Typical Nonlinear Elements

Original Periodical: Izv. AN SSSR, Otd. tekhn. n., 1956, No 4, 33-41

Abstract: A method is given for calculating the moments of various orders under the influence of normal fluctuations on inertialess nonlinear elements with piecewise-linear characteristics. With this, the normal function of the probability density is represented in the form of an infinite series in powers of the correlation coefficient of the acting random disturbance ρ (Kramer, G., Mathematical Methods of Statistics, GIIL, 1948, 321). In particular, for the correlation function of the input signal of a limiter, the following expression was obtained:

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USSR/Radiophysics - Statistical Phenomena in Radiophysics, I-3

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 35257

Abstract:

$$k(\tau) = c^2 \sigma^2 \sum_{n=1}^{\infty} \left[\phi^{(n-1)}\left(\frac{\alpha}{\sigma}\right) - \phi^{(n-1)}\left(-\frac{\beta}{\sigma}\right)\right]^2 \frac{\rho^n}{n!}$$

, where $\phi(z)$ is the error function, σ the dispersion of the input signal, and α, β, and c are determined from the characteristics of the limiter. Graphs and tables are given showing this dependence, and also average values and the dispersion of the output signal for various parameters of a symmetrical and nonsymmetrical limiter. The second-order moment is calculated for the case of simultaneous action of fluctuations and harmonic signal on the limiter.

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TIKHONOV, V. I.

PA - 1343

CARD 1 / 2

SUBJECT USSR / PHYSICS
AUTHOR TICHONOW, W.I.
TITLE Experimental Examination of the Rules Concerning the Distribution of Fluctuation Peaks According to Duration.
PERIODICAL Radiotechnika, 11, fasc. 8, 31-35 (1956)
Issued: 9 / 1956 reviewed: 9 / 1956

On the occasion of the solution of many radiotechnical problems it is of importance to know the density of the distribution of the probable duration τ of the fluctuation peaks and of the intervals T between the peaks. A peak is a development which is characterized by the fact that the value of a chance function ξ (t) (representing fluctuation) assumes a certain level a = const in the course of the time τ (duration of peak). In the same way the interval T between the peaks is defined. These rules are the necessary preliminary conditions for the analysis of the influence exercised by fluctuation disturbances in various relay devices in radiotechnology and automatics. We are interested in the mean value of the relay wear within the time unit and in the function of distribution density for the voltage impulses and the intervals between them. The formulae mostly given are insufficient. They permit no classification of peaks. The rules concerning distribution density were found theoretically, but mathematical results are too complicated and cannot be used for technical computations. For this reason the following experimental method was tried out: The source of normal fluctuations was the noise of the diode LG-16. A photometrical device controlled the output fluctuations. Hereupon

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Radiotechnika, 11, fasc.8, 31-35 (1956)

fluctuation was photographed by means of the two-beam impulse oscillograph OK-17M. The drive velocity was arranged so that each oscillogram had about 5 peaks. Even though the results are not sufficient for the drawing of general conclusions, some preliminary conclusions are nevertheless possible. Results are shown in a table.

INSTITUTION:

TIKHONOV, V.I.

1-3

Category : USSR / Radio Physics. Statistical Phenomena in Radio Physics.

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 7237

Author : Tikhonov, V.I.

Title : When Can a Non-Stationary Random Process be Replaced by a Stationary One?

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 9, 2057-2059

Abstract : The author emphasizes the importance of the problem of estimating the response of various physical networks a signal of the form $\eta(t) = \xi(t) \sin(\omega t + \varphi)$, where $\xi(t)$ is a stationary random process. By way of an example he calculates the correlation function of a voltage U, picked off the output of a RC network whose input is $U_0 \eta(t)$, where U_0 is a constant. It is shown that when calculating the dispersion $(\Delta u)^2$, the correlation function of the process $\eta(t)$ can be replaced by its time average, taken over a period $T = 2\pi/\omega$, only if the relation $RC \ll \tau_n \ll T$ is satisfied, where τ_n is the correlation time of the process $\xi(t)$.

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Card : 1/1

109-2-1-3/17

AUTHOR: Tikhonov, V. I.

TITLE: Effect of Differentiation and Integration of Fluctuations on the Average Number of Blips (Vliyaniye differentsirovaniya i integrirovaniya flyuktuatsiy na sredneye chislo vybrosov)

PERIODICAL: Radiotekhnika i Elektronika, 1957, Vol 2, Nr 1, pp 23-27 (USSR)

ABSTRACT: A change in the average number of blips when normal fluctuations are subjected to differentiation or integration with some weight is computed. Formula (1) presents the average number of blips of a random function in a unit of time which exceeds a certain constant level. The case of normal fluctuations subjected to differentiation is considered; formulas (8) and (9) give the average number of blips of the random function and its derivative. With relative levels equal (11) and with normal stationary fluctuations for which type (6) correlation function holds true, the number of blips of the derivative exceeds the number of blips of the random function proper by $\sqrt{3}$ times. With ideal integration, the average number of blips of the random function is equal to zero at all levels. For practical purposes, it is interesting to know how the average number of blips increases or decreases when the fluctuations

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109-2-1-3/17

Effect of Differentiation and Integration of Fluctuations on the Average Number ...

are integrated or differentiated with a certain weight. An elementary RC circuit is examined; voltage blips on R (differentiation) and voltage blips on C (integration) are analyzed. Spectral intensities are substituted for correlation functions in order to eliminate the allowance for starting conditions. Equality of relative levels is assumed. Formula (20) presents the change in the number of blips of the voltage on the resistance R as compared with the applied fluctuation voltage; W stands for the Wittaker function. Formula (20) is analyzed for very large gamma (see formula (21)) and for very small gamma, in which case the Wittaker functions are replaced by the degenerate hypergeometrical functions.

There is one figure and three Soviet references in the article.

SUBMITTED: January 7, 1956

AVAILABLE: Library of Congress

1. Electrical equipment--Electrical properties 3. Electrical equipment --Mathematical analysis

Card 2/2

TIKHONOV, V.I.

109-4-16/20

AUTHOR: Tikhonov, V.I.

TITLE: A Method of Determining the Envelope of Quasi-harmonic Fluctuations. (Odin metod opredeleniya ogibayushchey kvazi-garmonicheskikh flyuktuatsiy)

PERIODICAL: Radiotekhnika i Elektronika, 1957, Vol.2, No.4, pp. 502 - 505 (USSR).

ABSTRACT: If a white noise signal is applied to a system having a bandwidth Δf, such that $\Delta f \ll f_0$ where f_0 is the centre frequency, the signal at the output can be expressed as:

$$\xi(t) = A(t)\cos\left[\omega_0 t + \varphi(t)\right] \qquad (3)$$

where $A(t)$ and $\varphi(t)$ are slowly-changing functions (in comparison with $\cos\omega_0 t$). $A(t)$ can be referred to as the envelope and $\varphi(t)$ as the phase of the random output signal. The envelope function can be expressed as:

$$A(t) = \left[\xi^2(t) + \omega_0^{-2} v^2(t)\right]^{\frac{1}{2}} \qquad (9)$$

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109-4-16/20

A Method of Determining the Envelope of Quasi-harmonic Fluctuations.

where:

$$v(t) = \dot{\xi}(t) = \frac{d\xi(t)}{dt}.$$

The above formula is used in the derivation of an expression for the two-dimensional probability density distribution for $A(t)$, (eg.(20)). There are 2 figures and 5 references, of which 1 is Slavic.

SUBMITTED: February 7, 1956.

AVAILABLE: Library of Congress.

Card 2/2

TIKHONOV, V. I.

109-5-7/22

AUTHOR TIKHONOV, V.I., AMIANTOV, I.N.

TITLE The Influence of the Signal and of Noise on Non-Linear Elements (Direct Method)
(Vozdeystviye signala i shuma n nelineynyye elementy (pryamoy metod).

PERIODICAL Radiotekhnika i Elektronika, 1957, Vol 2, Nr 5, pp 579-590 (U.S.S.R.) Russian)

ABSTRACT Ray's method (S. Ray's "Theory of Fluctuation Noise", a collection of articles, IL, 1953, and D. Middleton, "Some General Results in the Theory of Noise Through Non-Linear Devices", Quaterly of applied mathematics, 1948, 5, 4, 445) is at present used for the determination of correlation functions at the input of non-linear inertialess elements. But for calculating the correlation function integration can be carried out immediately with two-dimensional probability densities which are represented in form of a series. This method may be called the direct one. It is closely connected with that of Ray's and leads to similar results. An investigation is carried out here by means of the direct method of the influence of a harmonic signal and of the normal fluctuations on non-linear inertialess elements with partially linear characteristics (modulator, frequency multiplier, limiter). The here-described examples show that it is the natural result of the direct method to express the answer by tabulated derivations and by the integrals of the error function

Card 1/2

109-5-7/22

The Influence of the Signal an. of Noise on Non-Linear Elements (Direct Method)

$$\varphi(\lambda) = \frac{1}{\sqrt{2\pi}} e^{-\frac{\lambda^2}{2}}$$

The same result is obtained b: means of Ray's method. (2 tables, 4 illustrations an . 5 Slavic references).

ASSOCIATION Not given
PRESENTED BY
SUBMITTED 17.8.1956
AVAILABLE Library of Congress

Card 2/2

TIKHONOV, V. I.

RECEPTION

"Overshoots of Fluctuations and their Correlation Characteristics," by V. I. Tikhonov, Elektrosvyaz', No 6, June 1957, pp 10-14

The author reports on an experimental investigation of the distribution of overshoots of normal and Rayleigh fluctuations with respect to duration, and estimates their correlating ability.

Card 1/1

T[illegible]NOV, V. T.

APPROVED FOR RELEASE: 07/16/2001 CIA-RDP86-00513R001755620008-7"

Tikhonov, V. I.

TIKHONOV, V.I.

Effect of natural fluctuations on the performance of a feed-back generator. Vest.Mosk.un.Ser.mat.,mekh., astron.,fiz.,khim. 12 no.2:53-64 '57. (MIRA 10:12)

1.Kafedra kolebaniy Moskovskogo universiteta.
(Oscillators, Electron-tube)

TIKHONOV, V. I.

AUTHOR ABRAMOV, B. V., TIKHONOV, V. I.,

TITLE Experimental Investigation of the Audio-Frequency Static of Tubes and Semiconductor Triodes.
(Eksperimental'noye issledovaniye nizkochastotnykh shumov lamp i poluprovodnikovykh triodov - Russian)

PERIODICAL Radiotekhnika, 1957, Vol 12, Nr 6, pp 45-51 (U.S.S.R.)

ABSTRACT The level measurements of static noise were carried out according to the method of the comparison between the static noise of radio tubes and that of the effective resistance at normal room temperature. A spectral analyzer with 27 exchangeable filters in the frequency range of 30C ÷ 15KC was used for the determination of spectral density of static at various frequencies. The relative transmission range of the filter $\frac{\Delta f}{f}$ is constant and equal to 0,2 The spectral intensity of the static of the tube investigated can be assumed as beeing approximately constant within the bounderies of the transmission range of the single filters. A valve voltmeterLV-9 was used as initial indicator; its indications are dependent on the levelof the static and therefor make it possible to fix this level. The basic amplifier has an amplification coefficient of about $2 \cdot 10^6$ and a transmission range of from 50-20,000C. It consists of four cascades. A description of the method of operation follows. Investigated were: audio-frequency spectra of the fluctuatung static of the 6Zh4 and 6Zh1P tubes in the case of pentode- and triode switching as well

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Experimental Investigation of the Audio-Frequency Static of Tubes and Semiconductor Triodes.

as spectra of the static of two semiconductor plane triodes P1A The results are shown in 3 tables. The errors of measurement were about 15%, in the case of the lowest frequencies up to 30%.
(With 3 tables, 3 illustrations and 1 Slavic reference)

ASSOCIATION
PERSENTED BY
SUBMITTED 16.5.1956
AVAILABLE Library of Congress
Card 2/2

SOV-109-3-4-27/28

AUTHORS: Tikhonov, V. I. and Amiantov, I. N.

TITLE: Discussion: Reply to V. S. Troitskiy (Diskussii: Otvet V. S. Troitskomu)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 4, pp 580-581 (USSR)

ABSTRACT: The authors agree with V. S. Troitskiy that their Eq.(3) should be regarded as being approximate. On the other hand they disagree with his second conclusion. However, the authors express their gratitude to V. S. Troitskiy for his interest in their work. There are 6 references, 2 of which are Soviet and 4 English.

SUBMITTED: October 19, 1957

1. Electron tube oscillators--Mathematical analysis 2. Electron tube oscillators--Performance 3. Electron tube oscillators--Theory

Card 1/1

103-19-4-5/12

AUTHORS: Amiantov, I. N., Tikhonov, V. I. (Moscow)

TITLE: Influence of Fluctuations on the Operations of an Auto-Range-Finder (Vliyaniye fluktuatsiy na rabotu avtodal'nomera)

PERIODICAL: Avtomatika i Telemekhanika, 1958, Vol. 19, Nr 4, pp. 325-333 (USSR)

ABSTRACT: The system of an automatic convoy of the target by radar according to the distance here is called a auto-rangefinder. A structure scheme of such a system is given here and a short description of the mode of operation of such an auto-rangefinder is given. The operation of the simplest model of an auto-rangefinder in the presence of sufficiently small fluctuations and of an immovable target is examined. In the construction of the model the following was assumed: 1) The shape of the pulses, which are reflected by the target, is approximated by a trapezoid, while the selector-impulses are assumed to be rectangular ones with certain height. 2) The differential detector reacts on the difference of the impulse-areas of the time detector S_2 and S_1. 3) The shift δT_n of the selector impulses with regard to the sounding pulse in the n-th period of

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repetition is proportional to the increase in voltage at the input of the time modulator: $\delta T_n = k_2 \Delta u_D^{(n)}$. T_n denoting the sounding pulse. $\Delta u_D^{(n)}$ denotes the voltage increase at the output of the differential detector. k_2 denotes a certain proportionality factor. In the investigation of the disturbances it is assumed that at the system input beside the intelligence signal $u(t)$ act also eigenfluctuations from the radio receiver output. These form an arbitrary steady process $\xi(t)$. It is assumed that the intensity of the fluctuations $\xi(t)$, which is characterized by the dispersion σ^2, is not too high in such a way that the detuning ΔT_n is low and the possible wrong response of the coincide tube can be neglected. It is shown that in the case of the coincidence tube can be neglected. It is shown that in the case of not too high fluctuations the difference $S_2(n)-S_1(n)$ is an random quantity. The equation (10) is derived for a closed circuit and graphically interpreted. It is shown that the fluctuations cause a change of the inclination at the "reflecting line" and a shift of it along the axis of ordinates. The change of the inclination and the shift are different in case of different n. The detuning ΔT_n in the general case is a nonsteady

Influence of Fluctuations on the Operations of an 103-19-4-5/12
Auto-Range-Finder

random function of the discreet $t_n = nT_0$, whereby the mean value is $\overline{\Delta T_n} = 0$. Such a character of ΔT_n makes it necessary to determine the stability, the instability, and the error of the tracking circuit of the auto-tracking system separately. It is assumed that the system is stable, if a finite limit of the sequence of $\overline{\Delta T_n^2}$ exists: $\sigma^2_{\Delta T} = \lim\limits_{n \to \infty} \overline{\Delta T_n^2}$. The system is unstable if no finite limit exists. As quantitative measurement of the error of the stability of the system the quantity

$$\sigma_{\Delta T} = \sqrt{\lim_{n \to \infty} \overline{\Delta T_n^2}}$$

is assumed.

In the next section the statistical characteristics are investigated and the equation (22) is derived for $\sigma^2_{\Delta T}$. The first term characterizes the influence of the propagation of the disturbation at the top and at the edges of the pulse, while the second term reproduces the vibration of the response-moment. For low σ an approximated formula (24) is obtained. If a concrete form of the correlation factor $R(\tau)$ is chosen, numerical evaluations according to formulae (23) and (24) can

Card 3/4

Influence of Fluctuations on the Operations of an Auto-Range-Finder 103-19-4-5/12

be performed. Finally the equation for the limit of stability is solved and the formula (25) derived for σ_o^2. In a three-dimensional space with the coordinates k, u_o and $\sigma^2(25)$ determines a surface. An intersection of this surface with the plane k=constant results in a parabola, and an intersection with the plane u_o = constant a hyperbola. Points within this surface belong to the stable domain, points outside of it belong to the unstable domain. There are 6 figures, and 2 references, which are Soviet.

SUBMITTED: March 29, 1957

AVAILABLE: Library of Congress

1. Radar range finders--Operation 2. Radar range systems --Analysis

Card 4/4

SOV/103-19-8-1/11

AUTHOR: Tikhonov, V. I. (Moscow)

TITLE: The Fluctuation Action in the Simplest Parametric Systems (Vozdeystviye fluktuatsiy na prosteyshiye parametricheskiye sistemy)

PERIODICAL: Avtomatika i telemekhanika, 1958, Vol. 19, Nr 8, pp. 717-724 (USSR)

ABSTRACT: The problem of the action of random signals on non-linear systems cannot be solved accurately in some cases, where a number of simplifications must be made. Sometimes it is possible to reduce the problem to the solving of a differential equation of first order with a variable coefficient, as shown by form (1): $dy/dt = \xi(t)y = \eta(t)$, where $\xi(t)$ and $\eta(t)$ denote arbitrary functions. It is assumed that these functions are correlated, steady and normal functions with known characteristics. Contrary to reference 1 another solution for equation (1) is given in this paper. The formula (4) is deduced, which permits to simplify greatly the computation of the statistical characteristics $y(t)$. For the computation of the various moments it is sufficient to use formula (5) for

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SOV/103-19-3-1/11

The Fluctuation Action in the Simplest Parametric Systems

the n-dimensional characteristic function of a normal arbitrary process. The mean value and the correlation function y(t) are calculated. (6) is obtained from (4), the first term of which represents the value of the unidimensional characteristic function of a normal process. The correlation function y(t) is obtained: equation (10). Formula (11) for the two-dimensional moment occurring in it is derived from formula (4). The formulae fo the three-dimensional and the fourdimensional characteristic function of a normal process, which are obtained from formula (5) for n = 3 and n = 4, are used for the computation of the individual summands of the right hand side of this formula. In this manner (12), (13) and (14) are obtained. The values found from these three formulae are inserted into(11) and (10), whereafter the general formula for the correlation function is found. As this formula is rather lengthy, the considerations are restricted to a few special cases. 1) $y_o = 0$, $t_o = 0$ and $\xi(t) = m_1$. $m_1 = \langle \xi(t) \rangle$. In this case equation (1) is transformed into a linear differential equation of first order with an arbitrary driving force. (15) is obtained from formula (9). It is shown that in the case of $m_1 > 0$ a steady value of the correlation function

Card 2/3

The [illegible]luctuation [illegible]ction in the Simplest [illegible]arametric [illegible]ystems

exists. 2) $\eta(t) \equiv 0$. With the help of formula (1[illegible]) the correlation function is determined and from it the [illegible]persion. It is shown that from a certain moment onwards, the dispersion will increase unlimitedly and the investigated system (at initial conditions not equal to zero) appears to be unstable with respect to the dispersion, if (16) is satisfied, although the mean value tends towards zero. This uncommon [illegible] [illegible] interpreted physically. 3) $y_o = 0$, $t_o = 0$ and the arbitrary functions $\xi(t)$ and $\eta(t)$ are not correlated. (17) is obtained from (9). It is shown that the mean value at a steady state will be finite if condition (16) is satisfied. Furthermore formula (18) for the two-dimensional moment is derived. It is difficult to find conditions under which, for example, the dispersion in a steady process has a finite value without concrete data concerning the correlation factors [illegible] and [illegible] being given. It is pointed to the fact that the special cases of the investigated example were already treated in references 2 and 3. There are 2 figures and 4 references, 2 of which are Soviet.

Card 3/3

TIKHONOV, V.I.

Effect of fluctuations on an inertial detector. Nauch. dokl. vys. shkoly; radiotekh. i elektron. no.2:225-233 '59. (MIRA 14:5)

1. Voyenno-vozdushnaya inzhenernaya akademiya im. prof. N.Ye. Zhukovskogo. (Radio detectors)

KUZNETSOV, P. I.; STRATONOVICH, R. L.; TIKHONOV, V. I. (Moskva)

Quasi-moment functions in the theory of random processess. Teor. veroiat. i ee prim. 5 no.1:84-102 '60. (MIRA 13:10)
(Probabilities)

S/109/60/005/05/017/021
E140/E435

AUTHOR: Tikhonov, V.I.

TITLE: Approximate Method of Calculating the Correlation Function of Stochastic Signals

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 5, pp 858-860 (USSR)

ABSTRACT: A random function is approximated by a piecewise-linear curve. This permits substituting a nonlinear inertial transform by a non-inertial transform. Limitations of the method are discussed. To estimate the applicability of the approximate method, the exact and approximate solutions are compared for the case of a stochastic signal frequency-modulated by a normal stationary noise. The relative differences in the worst case do not exceed 30%. There are 1 figure and 2 Soviet references.

SUBMITTED: October 8, 1959

Card 1/1

83150

S/108/60/015/009/002/008
B002/B067

6.9000; 6.9400

AUTHORS: Tikhonov, V. I., Amiantov, I. N., Members of the Society

TITLE: Probability Densities for the Duration of Pips of Fluctuations

PERIODICAL: Radiotekhnika, 1960, Vol. 15, No. 9, pp. 10-20

TEXT: Very complex formulas are obtained by the rigid theoretical solution for the probability densities of the duration of pips of noise fluctuations, thus rendering calculations very extensive. Three methods are available for approximate calculation: 1) Rice's method (Ref. 2); 2) the method of uncorrelated pulses; 3) The method of least squares. The present paper gives the numerical values (Tables 1 and 2) obtained by the various methods and a comparison with experimental data. Oscillograms were taken of the individual random processes, and were also evaluated (Fig. 4). Besides, the results of Ref. 12 are given, which were obtained by another method (Fig. 5). By this method, the pips of fixed duration were transformed into standard pulses, and the number of standard pulses was then chosen for a sufficiently long period of time.

X

Card 1/2

83150

S/108/60/015/009/002/008
B002/B067

Probability Densities for the Duration of Pips of Fluctuations

A comparison of the calculated values with the curve obtained (Fig. 7) shows good agreement. There are 7 figures, 2 tables, and 15 references: 11 Soviet, 2 British, and 1 Australian.

X

SUBMITTED: July 24, 1959

Card 2/2

9.3200

78158
SOV/103-21-5-4/21

AUTHOR: Tikhonov, V. I. (Moscow)

TITLE: Operation of Automatic Frequency Phase Control in the Presence of Noise

PERIODICAL: Automatika i telemekhanika, 1960, Vol 21, Nr 5, pp 301-309 (USSR)

ABSTRACT: The basic purpose of this paper is to calculate the average difference $\bar{\varphi}$ between the frequencies of the reference generator and the synchronized generator in an automatic phase control (APC) system. The expressions for the oscillations of the reference and the synchronized generator are given as:

$$u_0(t) = A_1 \cos \Phi_1 = A_1 \cos(\omega_0 t + \theta_1), \qquad (4)$$

$$u(t) = A_2 \sin \Phi_2 = A_2 \sin(\omega t + \theta_2),$$

Here, $\Phi_2 - \Phi_1 = \varphi$; A_1, A_2 are constant amplitudes; ω_0 and ω, average frequencies; $\theta_1(t)$ and $\theta_2(t)$,

Card 1/4

random phases caused by the noise of the generator tubes and by the loss resistances of the generator elements. In addition to the instability of the generator frequencies, an external fluctuation noise $n(t)$ is present in the channel of the reference generator. The correlation function $k_n(\tau)$ of this noise may be written as:

$$k_n(\tau) = \sigma^2 r(\tau) \cos \omega_0 \tau.$$

It is shown that the stationary operating conditions of the APC system may be described by a Fokker-Planck equation for which an exact solution exists only when the initial mismatch Δ_0 of the generators equals zero, i.e., $\Delta_0 = \omega_{so} - \omega = 0$, where ω_{so} is average frequency of the synchronized generator. In this case, $\overline{\dot{\phi}} = 0$ and the variance $\sigma_{\dot{\phi}}^2 = \overline{\dot{\phi}^2}$ of the frequency difference increases as the external noise and the generator's own fluctuations increase; $\sigma_{\dot{\phi}}^2$ decreases when the time constant of the RC filter increases. A method is outlined for the approximate solution of the Fokker-Planck equation for the case of $\Delta_o \neq 0$. An example is given illustrating the case when the frequency instability of the reference and the synchronized generator may be neglected in comparison with noise n(t). The author arrives at the following conclusions: (1) The average frequency difference and its mean square value diminish as A/σ increases. At sufficiently small signal-to-noise ratios, the average frequency difference may be considerably smaller than its mean square value. (2) Decreasing the time constant RC decreases the duration of the transient processes in the APC system. However, the variance of the frequency difference is thereby increased. Therefore, the requirements of rapid stabilization and of high noise immunity are in a certain sense contradictory. The help of R. L. Stratonovich is acknowledged. There are 9 references, 7 Soviet, 2 U.S.

Operation of Automatic Frequency Phase Control in the Presence of Noise

78158
SOV/103-21-3-4/21

The U.S. references are: Ming Chen Wang, Uhlenbeck, On the Theory of the Brownian Motion, Review of Modern Physics, Vol 17, Nr 2-3, 1945; Kramers, H. A., Brownian Motion in a Field of Force and the Diffusion Model of Chemical Reactions, Physics, Vol 7, Nr 4, 1940.

SUBMITTED: May 20, 1959

Card 4/4

TIKHONOV, V.I.

Reply to I.A. Bol'shakov. Avtom. i telem. 21 no.7:1089 Jl '60.
(MIRA 13:10)

(Automatic control) (Bol'shakov, I.A.)

TIKHONOV, Vyacheslav Il'ich; KUZNETSOVA, N.I., red.; RAKOV, S.I., tekhn.red.

[Safety measures in bench work] Tekhnika bezopasnosti pri slesarnykh rabotakh. Moskva, Izd-vo VTsSPS Profizdat, 1960. 106 p. (MIRA 14:4)

(Machine-shop practice--Safety measures)

TIKHONOV, V. I.

Papers submitted for the 10th Pacfic Science Congress, Honolulu, Hawaii 21 Aug-6 Sep 1961.

SKOPINTSEV, B. A., Marine Hydrophysics Institute, Academy of Sciences USSR -
"Investigation into mineralization of organic substances of dead
plankton under anaerobic conditions" (Section VII.C.1)
SMETANIN, D. A., Institute of Oceanology - "Some regularities concerning
the zonal distribution of chemical characteristics in the waters of
the central part of the Pacific" (Section VII.C.1)
SOKOLOV, S. A., All-Union Scientific Research Institute of Marine Fishing
and Oceanography - "Submarine 'Severyanka' - a new means for marine
fishery investigations" (Section III.C.4)
SOKOLOVA, M. N., Institute of Oceanology - "The distribution of deep-sea
biocoenosis in the Pacific in connection with food conditions"
(Section III.C)
SOROKIN, Yu. I., Institute of Biology of Reservoirs, Academy of Sciences
USSR - "The submarine illumination and the primary production of photo-
synthesis in the sea" (Section III.C.4)
STEGMAN, B. K., Institute of Biology of Reservoirs, Academy of Sciences
USSR - "The problem of Beringian continental connection in the ornitho-
geographic elucidation" (Section III.A.3.a)
SYSOYEV, N. N., and SHIREY, V. A., Institute of Oceanology - "The measure-
ment of deep oceanic currents with the application of anchor buoys
(methods, apparatus, results)" (Section VII.D.5)
TAREYEV, B. A., and FOMICHEV, A. V., Institute of Oceanology - "Geostrophic
currents in the Antarctic sector of the Pacific" (Section VII.D.1)
TIKHONOV, V. I., Institute of Geology - "New data on the tectonics of
southern Kamchatka" (Section VII.C)
TUMARKIN, D. D., Institute of Ethnology - "The ethnologic study of the
peoples of Oceania in the USSR" (Section II.B)
UDINTSEV, G. B., Institute of Oceanology - "Features of evolution in the
bottom topography of the Pacific Ocean" (Section VII.C.1)
VAKHRAMEYEV, V. A., Institute of Geology - "Cretaceous floras of the
Pacific coast in the USSR as a basis for the subdivision of continental
deposits of this age" (Section VII.C)
VINOGRADOVA, N. G., Institute of Oceanology - "Geographical distribution
of abyssal bottom fauna and the problem of vertical zonation"
(Section III.C)
VITVITSKIY, G. N., Moscow State University, Geographical Faculty -
"On the nature of the summer monsoon in east Asia" (Section VI.C)
VLASOV, G. M., Institute of Geology - "The island arches and the peripheric
folded areas in the western belt of the Pacific belt" (Section VII.C)
YANOVSKAYA, T. B., and KEYLIS-BOROK, V. I., Institute of Earth Physics
imeni O. Yu. Schmidt - "Some possibilities in interpretation of surface
waves of the Pacific" (Section VII.C.2)
YANSHIN, A. L., Institute of Geology - "The tectonic map of Eurasia"
(Section VII.C)
YATSENKO-KHMELEVSKIY, Andrey A., The Leningrad Forestry Engineering
Academy imeni S. M. Korov - "Some problems involved with wood studies
in southeast Asia" (Section III.A.7)
YEFREMOV, Yu. K., Asst. Director, Geographical Museum, Moscow State
University - "The physico-geographical zonation of the Sakhalin and
the Kuril Islands" (Section VI.D)
ZAKLINSKAYA, Ye. D., Institute of Geology - "On the relations between
the Upper Cretaceous and Paleogene floras of Australia, New Zealand,
and Eurasia" (Section III.A)
ZENKEVICH, L. A., and FILATOVA, Z. A., Institute of Oceanology - "General
regularities in the quantitative and qualitative distribution of the
bottom fauna in the Pacific" (Section III.C)
ZHAROVA, T. V., and KOBLENTS, N. M., Institute of Zoology - "The comparative
study in methods of primary production investigation of fresh-water
plankton" (Section III.C)
ZHIRMUNSKIY, A. V., Institute of Cytology - "Cytophysiological investigation
of temperature adaptations of invertebrates in the northwestern area of
the Pacific Ocean" (Section III.C)
ZHIVAGO, A. V., Institute of Geography - "Outlines of southern ocean
geomorphology" (Section VII.D.1)

29550
S/106/61/000/011/002/006
A055/A127

6,9400

AUTHORS: Tikhonov, V. I., and Goryainov, V. T.

TITLE: Effect of normal noise and limiters.

PERIODICAL: Elektrosvyaz', no. 11, 1961, 13 - 24

TEXT: This article deals essentially with the determination of the one-dimensional probability density of noises at the output of the filter-limiter-filter systems. An experimental device used for this determination is described. The normalization of the limited noises is also treated. The experimental device is shown in Figure 1. A normal ГВШ-1 (GVSh-1) noise generator is used as noise source (N. Gen.) generating noise with a spectrum within the 100 - 2 · 10^6 cps range. The noise is applied to the resonance amplifier (Amp_1), whose resonant frequency f_0 = 110 kc and whose passband can vary by steps and take the following values: Δf_1 = 1.5, 3.75, 6.5, 11, 21, and 38 kc; the amplitude-frequency characteristics are well approximated by the Gaussian curves

$$K(\omega) = K_0 \exp\left\{-\beta(\omega - \omega_0)^2\right\} \quad (1)$$

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S/106/61/000/011/002/006
A055/A127

Effect of normal noise and limiters

The normal stationary noise with the energy spectrum determined by the amplitude-frequency characteristic of Amp_1 acts upon the input of the symmetrical two-stage limiter (Lim.). The RMS-value of the noise at the limiter input is measured by a thermo-voltmeter consisting of a cathode follower (C.F.), a thermocouple (T.C.) and a galvanometer (Gal_1). From the limiter output the noise is applied to the resonance amplifier (Amp_2) tuned to f_0 = 110 kc and whose passband is Δf_2 = 9 kc. The noise is then applied to a photometric device for determining the one-dimensional probability densities. This device consists of an oscillograph (Osc.), a photoelectron multiplier (P.E.M.) and a galvanometer (Gal_2) measuring the multiplier current. If a normal stationary quasi-harmonic noise

$$\xi(t) = A(t) \sin[\omega_0 t + \varphi(t)] = A(t) \sin\theta(t), \tag{2}$$

A(t) being the envelope of the noise with the Rayleigh probability density

$$W_1(A) = \frac{A}{\sigma_\xi^2} \exp\left(-\frac{1}{2}\frac{A^2}{\sigma_\xi^2}\right) \tag{3}$$

and φ (t) being a random phase uniformly distributed in the interval $(-\pi, \pi)$, is acting on the input of an inertialess symmetrical limiter with a volt-ampere cha-

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S/106/61/000/011/002/006
A055/A127

Effect of normal noise and limiters

racteristic $\eta(t) = g[\xi(t)]$, the noise $\eta(t)$ at the limiter output will be,

$$\eta(t) = B(t) \sin \theta(t) \quad (4)$$

where the envelope B(t) is determined by the relations:

$$B(t) = \begin{cases} SA(t), & A \leqslant \alpha \\ H, & A > \alpha \end{cases} \quad (5)$$

$S = H/\alpha$ being the steepness of the limiter characteristic. The one-dimensional probability density for B(t) will be:

$$W_1(B) = \frac{B}{\sigma_1^2} \exp\left(-\frac{1}{2}\frac{B^2}{\sigma_1^2}\right) + N\delta(B - H), \quad B \leqslant H \quad (6)$$

where

$$\sigma_1 = S\sigma_\xi \quad (7)$$

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Effect of normal noise and limiters

and $$N = \exp\left(-\frac{1}{2}\frac{H^2}{\sigma_1^2}\right) \qquad (8)$$

The combined probability density is:

$$W_2(B, \theta) = \frac{1}{2\pi}\left\{\frac{B}{\sigma_1^2} e^{-\frac{1}{2}\left(\frac{B}{\sigma_1}\right)^2} + e^{-\frac{1}{2}\left(\frac{H}{\sigma_1}\right)^2} \delta(B - H)\right\}, \quad \begin{array}{l} 0 \leqslant B \leqslant H, \\ -\pi \leqslant \theta \leqslant \pi \end{array} \qquad (10)$$

Introducing new variable $z = \sin\theta$ and $\eta = B \sin\theta = Bz$, the authors obtain the final formula for the one-dimensional probability density of the random signal $\eta(t) = B(t) \sin\theta(t)$ at the output of the symmetrical limiter:

$$W_1(\eta) = \frac{1}{\pi\sqrt{H^2 - \eta^2}} e^{-\frac{1}{2}\left(\frac{H}{\sigma_1}\right)^2} + \frac{2}{\sqrt{2\pi}\sigma_1} e^{-\frac{1}{2}\left(\frac{\eta}{\sigma_1}\right)^2} \times$$
$$\times \left[\Phi(V) - \frac{1}{2}\right], \quad |\eta| \leqslant H \qquad (16)$$

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Effect of normal noise and limiters

where

$$\Phi(V) - \frac{1}{2} = \frac{1}{\sqrt{2\pi}} \int_0^V e^{-\frac{1}{2}x^2} dx, \quad V = \frac{1}{\sigma_1}\sqrt{H^2 - \eta^2}. \tag{15}$$

Simplified formulae are obtained for the particular cases of weak medium and strong limiting. For weak limiting ($\sigma_0 \gg \sigma_\xi$):

$$W_1(\eta) = \frac{1}{\sqrt{2\pi}\,\sigma_1} \exp\left\{-\frac{1}{2}\left(\frac{\eta}{\sigma_1}\right)^2\right\} \tag{18'}$$

For medium limiting ($\sigma_0 = \sigma_\xi$):

$$W_1(\eta) = \frac{1}{2H}, \quad |\eta| \leqslant H. \tag{18''}$$

For stronglimiting ($\sigma_\xi \gg \sigma_0$):

$$W_1(\eta) = \frac{1}{2}\left[\delta(H - \eta) + \delta(H + \eta)\right]. \tag{18'''}$$

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The analysis of the experimentally obtained graphs leads to the following conclu-

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sions: 1) for $\nu = \frac{\sigma_\xi}{\sigma_0} < 0.3$, the one-dimensional probability density of the noise $\eta(t)$ is approximated satisfactorily by formula (18'); 2) for $\nu = 1.2 \div 1.3$, the noise at the limiter output can be considered as uniformly distributed in the interval [-H, H]; 3) for $\nu > 3$, formula (18''') can be used for the determination of the probability density. Normalization of limited noises. The noise $\eta(t)$ whose distribution differs from the normal one is normalized to a certain extent (when passing through amplifier Amp_2), depending on the magnitude of the relative limiting threshold and on the relation between the passband of Amp_2 and the width of the energy spectrum of $\eta(t)$. It is expedient to choose the excess coefficient

$$Y_2 = \frac{M_4}{M_2^2} - 3 \quad (21)$$

as the quantitative criterion of the degree of approximation of the probability density to the normal one. In (21), M_2 and M_4 are, respectively, the central moments of the second and the fourth order of the noise $\zeta(t)$ at the output of Amp_2. The theoretical computation of these moments being difficult, an experimental method was resorted to, using the device of Figure 1. The one-dimensional

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probability densities of the noise $\xi(t)$ at the output of a filter-limiter-filter system were determined for different relative limiting thresholds of the normal input noises and for different relations between the energy spectrum width of these normal noises and the passband of Amp_2. The thus obtained experimental data made it possible to calculate M_2 and M_4. The obtained graphs show that the excess coefficient decreases when the limiting threshold of the input noises $\xi(t)$ increases. For large thresholds, the noise $\eta(t)$ at the limiter output proves but little different from the normal one. For small values of the threshold, the noise $\eta(t)$ differs sharply from the normal one and is substantially normalized by the linear amplifier Amp_2. The last part of the article is a theoretical analysis of the noise spectrum at the output of the limiter. There are 9 figures, and 10 references: 8 Soviet-bloc and 2 non-Soviet-bloc. The references to the English-language publications read as follows: J. Galejs. Signal-to-noise ratios in smooth limiters. "Trans.IRE.", 1959, No. 2, IT-5. R. F. Baum. "The correlation function of smoothly limited gaussian noise". "Trans. IRE", 1957, No. 3, IT-3.

SUBMITTED: July 19, 1961

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Card 7/8 7

S/142/61/004/005/004/014
E140/E135

6.9400

AUTHOR: Tikhonov, V.I.

TITLE: On the distribution of greatest values in a finite interval realization of a fluctuation

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiotekhnika, v.4, no.5, 1961, 568-573

TEXT: In the estimation of unknown signal parameters the problem arises of calculating the probability density of the maximum values H (Fig.1), the locally maximum values of a random process. This presents a difficult technological problem and the article is concerned with the technologically feasible solution to the related problem, calculation of the mean number of noise maxima per unit time exceeding a given level. A theoretical analysis relating the two measures shows that the mean number of true maxima and the mean number of noise peaks practically coincide with $h = H/\sigma \geqslant 3$. That is, with $h \geqslant 3$ each peak can be considered to correspond to a maximum of the random function. This indicates that peak counting for this threshold will give a reliable estimate. In passing, the author

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On the distribution of greatest ... S/142/61/004/005/004/014
E140/E135

indicates that Rice's method (Ref.8: S.O. Rice, Distribution of the duration of fades in radio transmission, BSTJ, v.37, no.3, 1958, 581) is only applicable for the same limitation, $h \geqslant 3$. There are 3 figures, 1 table and 8 references: 2 Soviet-bloc, 4 Russian translations from non-Soviet-bloc publications, and 2 non-Soviet. The English language references read as follows:

Ref.2: A.F.J. Siegert. On the first passage time probability problem. Phys. Rev., v.81, 1951, 617.
Ref.8: as in text above.

ASSOCIATION: Vychislitel'nyy tsentr AN SSSR
(Computing Centre, AS USSR)

SUBMITTED: To NDVSh, September 13, 1959.
To Izv.vuz Radiotekhnika, February 4, 1960.

Card 2/2

KUZNETSOV, P.I.; STRATONOVICH, R.L.; TIKHONOV, V.I. (Moscow)

Some problems involving conditional prob[illegible]ity and quasi-moment functions. Teor. veroiat. i [illegible] 6 no.4:458-464 '61. (MIRA 14:11)

(Probabilities)

[illegible], V.I., [illegible]

[illegible] Elektrosviaz' 15 no.11:13-24 [illegible]. [illegible]

(Radio filters)
(Radio [illegible] and reception)

APPROVED FOR RELEASE: 07/16/2001 CIA-RDP86-00513R001755620008-7"

TIKHONOV, V.I.

Concerning the distribution of larges values in the realization of fluctuations with finite duration. Izv. vys. ucheb. zav.; radiotekh. 4 no.5:566-573 S-O '61. (MIRA 14:12)

1. Rekomendovana Vychislitel'nym tsentrom AN SSSR.
(Radio)

TIKHONOV, V.I.

Markoff envelope nature of quasi-harmonic fluctuations. Radiotekh. i elektron. 6 no.7:1082-1091 Jl '61. (MIRA 14:6)
(Differential equations) (Information theory)

L 17928-63 EWT(l)/EWG(k)/EWP(q)/EWT(m)/BDS/EEC(b)-2 AFFTC/ASD/ESD-3/IJP(C)
Pz-4 GG/JD/AT

ACCESSION NR: AT3002448 S/2935/62/000/000/0138/0147

72
70

AUTHOR: Yunovich, A. E.; Tikhonov, V. I.

TITLE: Kinetics of surface phenomena in silicon [Report at the Conference on Surface Properties of Semiconductors, Institute of Electrochemistry, AN SSSR, Moscow, 5-6 June 1961]

SOURCE: Poverkhnostny*ye svoystva poluprovodnikov. Moscow, Izd-vo AN SSSR, 1962, 138-147

TOPIC TAGS: silicon, semiconductor, silicon-surface characteristics

ABSTRACT: Experimental studies are described of the effect of field on silicon, with various frequencies and amplitudes, at room temperature. A d-c excited p-Si specimen placed in dry oxygen was irradiated by continuous or pulsed (30-1,000 cps) light; Specimens had a resistivity of 200-300 ohms.cm and a minority-carrier volume lifetime of 200 microsec. Both real and imaginary components of the signal from the specimen were measured. Effective mobility vs. frequency curves with and without irradiation are given, as well as a relaxation-time vs. pulse-amplitude curve. The experiments showed that: (1) Nonlinear conductivity variation, with

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growing field amplitude at 60-2 x 10^4 cps is associated with the effect of surface band distortion upon the relaxation time; (2) New method of investigation that includes measuring both the real and the imaginary components of the field effect is useful; (3) Majority carriers (holes) apparently play the principal role in the investigated phenomena; (4) Illumination of the specimen is apparently responsible for the ejection of electrons captured by surface states into the conduction band; (5) Concentration of surface states in Si was about 10^{12} - 10^{13} cm^{-2}. "The authors are sincerely thankful to Prof. S. G. Kalshnikov for his interest in the work and discussing the results." Orig. art. has: 4 figures.

ASSOCIATION: Moskovskiy gosudarstvenny*y universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 00 DATE ACQ: 15May63 ENCL: 00

SUB CODE: PH NO REF SOV: 008 OTHER: 011

Card 2/2

33788
S/108/62/017/002/003/010
D201/D305

6.9411 (1159)

AUTHORS: Tikhonov, V.I., and Kulikov, Ye.I., Members of the Society (see Association)

TITLE: The distribution of over-shoots and of maxima of fluctuations

PERIODICAL: Radiotekhnika, v. 17, no. 2, 1962, 15 - 23

TEXT: The authors analyze two problems: 1) To find the distribution of patterns of noise of fixed duration according to the number of overshoots (Fig. 1), and 2) To determine the distribution of maxima maximorum on patterns of noise of a given duration. The experimental investigation of problem (1) was carried out using an 8-stage TRF receiver and an amplitude detector. The amplitude frequency characteristic of the receiver up to the detector stage had a Gaussian shape

$$K(f) = K(f_0)e^{-3.68(f-f_0)^2} \quad (1)$$

where f_0 = 30 Mc/s - resonant central frequency of the pass band.

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The distribution of over-shoots ...

The 6 db bandwidth of the receiver was $\Delta f = 0.92$ Mc/s. The noise correlation coefficient at the amplifier (1) output was given by

$$R(\tau) = \exp(-\frac{1}{2}\alpha^2\tau^2)\cos\omega_0\tau \qquad (2)$$

where $\alpha = 1.65$ 1/microsec. The r.m.s. value of normal stationary noise at the detector input was $\sigma = 0.5$ V, the noise at the detector output has the probability density well approximated by

$$P(\eta) = 500\eta^{1.42}e^{-14.2\eta}, \qquad (4)$$

where η - the detector output voltage. The noise of the receiver was applied from the detector to the CRO type OK-17M and various duration photographs of this noise were made with the AKC-1 (AKS-1) camera. The duration of photographed noise patterns was T = 5, 25, 100, 500 and 2000 microseconds, about 500 different photographs being taken of patterns of each duration. The oscillograms were statistically processed with the resulting conclusion as follows: 1) At all T's with the increase of level H both the mean number and the dispersion of the number of H level crossings decreases. The ratio

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The distribution of over-shoots ...

$\sigma_n/\bar{n}$ decreases, however, with decreasing H level and increasing T. 2) While at low H levels the distribution is nearly symmetrical with respect to $\bar{n}$ and is similar to a normal distribution, with the increase of H the most probable value shifts towards small n, for large enough values of H the distribution becoming exponential. 3) The same photographs of noise were used for obtaining the probability-densities of maxima maximorum for patterns of fixed duration. During proof reading the authors learned that a similar problem has been investigated in the USA with the help of computers by S. Thaler and S.A. Meltzer (PIRE, v. 49, no. 2, 1961). The value of Hm of the maximum of maxima was determined for every pattern and from the values thus obtained histograms of maxima maximorum, referred to the r.m.s. value of noise at the input (0.5 V) were drawn. All histograms are well approximated by the normal curve

$$P\left(\frac{H_m}{\sigma}\right) = \frac{1}{\sigma_m\sqrt{2}} \exp\left[-\frac{1}{2\sigma_m^2}\left(\frac{H_m}{\sigma} - \frac{\bar{H}_m}{\sigma}\right)^2\right], \quad (5)$$

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The distribution of over-shoots ...

in which the mean value and are determined from

$$\frac{\bar{H}_m}{\sigma} = 1.1 + 0.47 \lg T, \qquad (6)$$

and

$$\sigma_n = 0.346 \exp\left[-\frac{1}{16.4}(1 + \lg T)^2\right]. \qquad (7)$$

The obtained graphs of probability density $P(H_m/\sigma)$ of maxima for patterns of different duration T show that with increasing T of a pattern the average value of $\bar{H}_m$ increases and dispersion decreases, the probability densities with increasing T becoming 'narrower' and 'higher'. The theoretical solution of the problem of obtaining the probability density for H_m is very complicated. An approximate solution of it is given which under some simplifying assumptions results in expressions which are in good agreement with experiment. There are 2 tables, 9 figures and 11 references: 3 Soviet-bloc and 8 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: C.W. Helstrom, IRE Trans.inform.theory, IT-3, no. 4, 1957; C.M. White, J.appl.phys., v. 29, no. 4, 1958;

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S/108/62/017/002/003/010
D201/D305

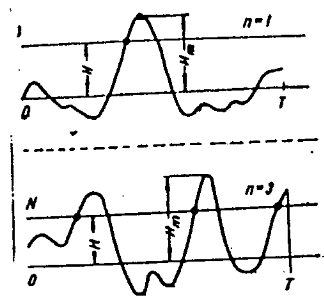
The distribution of over-shoots ...

S.O. Rice, BSTJ, v. 37, no. 3, 1958; M. Frankfort, PIRE, v. 48, no. 8, 1960.

ASSOCIATION: Nauchno-tekhnicheskoye obshchestvo radiotekhniki i elektrosvyazi im. A.S. Popova (Scientific and Technical Society of Radio Engineering and Electrical Communications imeni A.S. Popov) [Abstractor's note: Name of Association taken from first page of journal]

SUBMITTED: December 8, 1960

Fig. 1.



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38461
S/109/62/007/006/003/024
D271/D308

6,9200

AUTHOR: Tikhonov, V. I.

TITLE: Average number of frequency and phase pips

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 6, 1962, 940-948

TEXT: Formulas are derived for the number of phase and frequency pips when a harmonic signal is superimposed on quasi-harmonic noise which is defined as a normal stationary narrow-band random process with a zero average value and a spectral density symmetrical about the frequency of the signal. The sum of signal and noise is written out as

$$\eta_t = E(t) \cos\left[\omega_0 t - \psi(t)\right] \tag{6}$$

where E(t) is the envelope and $\psi(t)$ random phase of the sum of

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D271/D308

Average number of ...

the signal (ω_0) and noise. Calculation of the average number of frequency pips, i.e. of the points in which a certain level is exceeded in the ascending direction, is based on the two-dimensional probability density $W_2[\dot{\psi}(t), \ddot{\psi}(t)]$; this is obtained by integration from the probability density of the envelope, random phase and their first two derivatives. The method for obtaining the probability density of six normal stationary values is shown and a formula is derived which enables, in principle, to compute pips of the envelope, phase and their derivatives, as well as the probability density of maxima and minima of the envelope and phase. It is shown that the average number of phase pips depends on the width of the spectral density and not on the level. Simplified formulas are given for the pips of the phase $\psi(t)$ and of cos $\psi(t)$, assuming large signal-to-noise ratios. The latter case is of interest when phase detectors with limiters are used. Formulas for the average number of frequency pips are derived for two cases: in the absence of the signal and for large signal-to-noise ratios. The formula finally obtained brings a solution of the problem

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which was partly treated by S. O. Rice (Bell System Techn. J., v. 27, no. 1, 1948, 109); the application of the exact formula involves the use of tables of the confluent hypergeometric function. It is not yet established what value the signal-to-noise ratio must have to make approximate formulas valid.

SUBMITTED: October 20, 1961

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42725

S/109/62/007/011/002/012
D295/D308

6,4200

AUTHORS: Tikhonov, V.I. and Lar'kov, V.A.

TITLE: Experimental investigation of frequency blips

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 11, 1962, 1901 - 1909

TEXT: The following parameters are defined for the time derivative (frequency) of the random phase of the sum of a sinusoidal oscillation and quasi-sinusoidal gaussian noise, considered over a finite interval of time T: the number of times that the frequency crosses an assigned level, C, with a positive derivative (the number of positive blips, n) the time interval between a positive crossing and the next negative crossing (the blip duration, τ), the highest frequency value attained (the highest blip, H_m), and the frequency difference between a frequency maximum and the preceding frequency minimum (the blip height, h). Statistics of these parameters are important for assessing the region of applicability of optimum-reception methods and for optimum

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D295/D308

Experimental investigation ...

re~~ly~~a-type regulation systems. The mean values, standard deviations and distributions of n, τ, H_m and h were investigated for a given T ($T = 10$ / 1.5×10^{-3} sec.) and various C by using an experimental set-up that comprised a sound-frequency source, a noise source ($f = 50$ kc/s, $\Delta f = 5.5$ kc/s), a mixer, an IF amplifier ($f = 140$ kc/s, $\Delta f = 1.5$ kc/s), a bilateral limiter and a frequency detector, the input being either noise alone or noise plus signal of various S/N ratio~~n~~s. The result of statistical processing of 500 frequency oscillograms are shown in the form of tables and curves and agree well with theoretical results where available (for n and τ). Thus the τ distribution tends to an exponential distribution as C increases. There are 2 tables and 9 figures.

SUBMITTED: December 29, 1961

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TIKHONOV, V.I.

Outbursts of stochastic processes. Usp.fiz.nauk 77 no.3:449-480 Jl '62. (MIRA 15:7)

(Random processes)

TIKHONOV, V.I.; ZHURAVLEV, A.G.

Concerning the operation of synchronization devices in the presence of large noise. Radiotekhnika 17 no.9:40-48 S '62. (MIRA 15:9)

1. Deystvitel'nyye chleny Nauchno-tekhnicheskogo obshchestva radiotekhniki i elektrosvyazi imeni Popova.
(Frequency regulation)
(Oscillators, Electron-tube)

40489

S/106/62/000/009/001/003
A055/A101

9,3273

AUTHOR: Tikhonov, V.I.

TITLE: Operation of the frequency automatic frequency-trimming system in the presence of noises

PERIODICAL: Elektrosvyaz', no. 9, 1962, 3 - 13

TEXT: A stochastic differential equation describing the operation of this system in the presence of external normal noises is deduced under the following assumptions: 1) all the elements of the system, except the l-f filter, are inertialess; 2) the linear section of the reactance tube is used; 3) the frequency converter is replaced by a multiplying device; 4) the l-f filter is a simple integrating RC-circuit; 5) the external noise n (t) is normal, stationary, with zero average value; its spectral density is symmetrical with respect to the mean frequency of the signal. The underlying initial formulae are:

$$U_{sign}(t) = A_1 \cos \Phi_1(t) = A_1 \cos [\omega_0 t + \theta_1(t)]; \quad (1)$$

$$U_{heter}(t) = A_2 \sin \Phi_2(t) = A_2 \sin [\omega t + \theta_2(t)]; \quad (2)$$

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where A_1 and A_2 are constant amplitudes; ω_0 and ω are the mean frequencies of the oscillators in the absence of random disturbances; $\theta_1(t)$ and $\theta_2(t)$ are their random phases depending on their proper fluctuations, on the variation of external conditions and on the propagation conditions. The noise is

$$n(t) = E(t) \cos \Phi(t) = E(t) \cos [\omega_0 t + \theta(t)], \quad (3)$$

where $E(t)$ is the envelope of the fluctuations. In the expression for the sum of signal and noise, the author introduces the quantity:

$$\psi(t) = \operatorname{arctg} \frac{E_s(t)}{A_1 + E_c(t)}, \quad (5)$$

$E_{sin}(t)$ and $E_{cos}(t)$ being, respectively, the sine and cosine component of $E(t)$. The voltage at the output of the frequency discriminator can be considered as essentially determined by the expression

$$u_{fr.d.} = F(\dot{\Phi}_2 - \dot{\Phi}_1 - \dot{\psi} - \omega_{if}) = F(\omega - \omega_0 - \omega_{if} - \dot{\psi} + \dot{\theta}_2 - \dot{\theta}_1), \quad (10)$$

ω_{if} being the if amplifier center frequency; the superscript point denotes the time-derivative. S_1 being the transconductance of the reactance tube characteristic, ω_{init} being the heterodyne initial frequency, and $\alpha = \frac{1}{RC}$ (filter), the basic differential equation describing the operation of the system is:

$$\dot{\omega} + \alpha\omega = \alpha\omega_{init} - \alpha S_1 F(\omega - \omega_0 - \omega_{if} + \dot{\theta}_2 - \dot{\theta}_1) . \qquad (13)$$

Supposing that $\dot{\theta}_2 = \dot{\theta}_1 = 0$, (13) becomes:

$$\dot{\Omega} + \alpha\Omega = \alpha\Delta\omega_0 - \alpha S_1 F(\Omega - \dot{\psi}) , \qquad (14)$$

where

$$\Delta\omega_0 = \omega_{init} - \omega_0 - \omega_{if}, \quad \omega = \Omega + \omega_0 + \omega_{if} . \qquad (15)$$

Approximating the frequency discriminator characteristic by a cubic polynomial

$$F(\Omega - \dot{\psi}) = S(\Omega - \dot{\psi})\left[1 - \frac{(\Omega - \dot{\psi})^2}{3\Omega_0^2}\right] , \qquad (16)$$

where S is the linear section transconductance and Ω_0 is the frequency corres-